What is claimed is:

1. An apparatus, comprising:

a resonant tube in a micro-scale thermoacoustic device;

an acoustic driver, which creates a standing wave in said resonant tube; and

a stack configured to transport thermal energy from a gas in the resonant tube, wherein the stack has a first side and a second side, each positioned in a different position in the standing wave to create a thermal gradient between the first side and the second side.

2. The apparatus according to claim 1, wherein the first side is attached to a first heat exchanger and the second side is attached to a second heat exchanger.

3. The apparatus according to claim 1, wherein an electronic device is coupled to one side of the stack.

4. The apparatus according to claim 3, wherein the thermal gradient is established to transfer heat from the electronic device.

5. The apparatus according claim 1, wherein the acoustic driver is a vertical comb-drive.

6. The apparatus according to claim 1, wherein the resonant tube is tapered.

7. The apparatus according to claim 6, wherein the tapered resonant tube is created using gray scale technology.

8. The apparatus according to claim 1, wherein the stack is at least one of a pin array, parallel array, and tapered pin array.

9. The apparatus according to claim 1, further comprising:

a device to be cooled, where the thermoacoustic device has a first heat exchanger that is operationally attached to the cooled device so as to transfer heat from the cooled device via the stack to a second heat exchanger in the thermoacoustic device.

10. A resonance tube, for use in a micro cooling device, wherein the resonance tube is created by gray scale etching such that there exists a taper in the resonance tube, where the tapered resonance tube allows standing waves and reduces the occurrence of harmonic waves.

11. The resonance tube of claim 10, wherein the resonance tube is constructed by gray scale etching sections, and bonding the sections together to form the resonance tube.

12. A method comprising:

creating a standing wave in a resonant tube; and

transporting thermal energy from a gas in the resonant tube between a first side and a second side of a stack, wherein the first side and the second side are each positioned in a different position in the standing wave to create a thermal gradient between the first side and the second side.

13. The method of claim 12, further comprising:

creating the resonance tube by gray scale etching such that there exists a taper in the resonance tube, where the tapered resonance tube allows standing waves and reduces the occurrence of harmonic waves.

14. The method of claim 13, further comprising:

constructing by gray scale etching sections; and

bonding the sections together to form the resonance tube.

15. The method of claim 12, further comprising:

attaching the first side to a first heat exchanger and the second side to a second heat exchanger.

16. The method of claim 12, further comprising:

coupling an electronic device to one side of the stack.

17. The method of claim 16, further comprising:

establishing the thermal gradient to transfer heat from the electronic device.

18. The method of claim 12, further comprising: wherein the standing acoustic wave is created by an acoustic driver

19. The method of claim 18, wherein the acoustic driver is a vertical comb-drive.

20. The method of claim 12, wherein the resonant tube is tapered.